

XXVI. *On Tomopteris onisciformis, Eschscholtz.* By WILLIAM B. CARPENTER, *Esq.*,
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Read Jan. 20th, 1859.

THE animal which forms the subject of the present communication is one which has not very frequently presented itself to the notice of zoological inquirers; and it is not a little singular that almost every one under whose observation it has fallen has given an account of its structure differing in some essential particulars from that of other observers. This circumstance may of course be readily accounted for on the hypothesis that the several specimens examined have belonged not to the same, but to different specific types. I cannot but believe, however, that a careful comparison of the published accounts will lead others, as it has led myself, to the conclusion that all the specimens described are referable to one and the same type, and that the differences are chiefly those of *phase* or *stage* of development. For it is remarkable that the accordance should be closest in those details of structure which might be expected, on the hypothesis of specific difference, to be most liable to vary; whilst the diversities are greatest in those features which seem most liable to undergo modification in the progress of development.

I shall first give a detailed account of my own observations, and shall then compare them with the descriptions which I have since found to have been given of this creature by those to whom it had already presented itself. My observations were made in the month of September last, on specimens captured in Lamlash Bay, Arran. I was fortunate in being able at the time to obtain the assistance of Mr. George West, whose intelligence and scrupulous accuracy as a microscopic draughtsman are well known to all who have employed him; and the drawings which accompany this communication having been all executed by him with the objects immediately before him, and under my own direction as to the points to which his attention should be specially given, I cannot but consider that they have a value much greater than can be attached to many of the representations heretofore published, most of which seem to me to be little better than ideal diagrams.

The study of this animal, I may say *in limine*, presents peculiar difficulties, from its incessant restlessness, and from the circumstance that its delicacy is such, that confinement is speedily fatal to it, its tissues and organs exhibiting a manifest tendency to disintegration some time before it ceases to move. We had, however, the great advantage of being able to make our observations on *several* specimens in the younger and simpler stage which I shall first describe; and I feel sure that we had accurately mastered all the most important features of *its* structure, before I met with the remarkable, and not a little perplexing form, which I think I cannot be wrong in regarding as a more advanced stage of the same.

The first phase under which the *Tomopteris* presented itself to me is delineated in TAB. LXII. fig. 1, under a power of 10 diameters. Its entire length was about .20 of an inch. Its body was elongated, not quite cylindrical, but somewhat flattened, and extremely transparent; there was no other segmentation than that which was marked by the projection of the lateral appendages; but a delicate transverse wrinkling became apparent when a sufficient magnifying power was employed, as is indicated in figs. 2, 3, the former showing the *dorsal*, and the latter the *ventral* surface, under a power of 38 diameters. The part which may be designated as the *head*, from its containing the mouth, the nervous ganglia, and the eye-spots, and from its bearing what seem to be the principal organs of feeling, is not separated from the body by any constriction; and the perivisceral cavity is not only continued into it, but extends also into its appendages. These are of a very remarkable nature. In front of the head there projects (figs. 2, 3) what might be regarded as a short continuation of the body, narrowed into a kind of peduncle; and this terminates anteriorly in a pair of large horn-like appendages that project transversely on either side from their common base, somewhat after the fashion of the horns of certain Ruminants. Between the foregoing and the head, there arise from the under side of the peduncle a second pair of these horn-like appendages, which are smaller than the first; the inferior position of these is seen in fig. 4, which gives a *front* view of the head and its appendages. The perivisceral cavity is distinctly continued into the neck and the first pair of horns; but I could not satisfy myself that it penetrated into the second. From the sides of the head itself there projected a far more remarkable pair of appendages, nearly half the length of the body (fig. 1), which may for convenience be distinguished as the *styliform*. These were supported at the base by a lateral projection of the head on either side (figs. 2, 3), into which the perivisceral cavity extended, and which also contained the muscular apparatus that acted on the styliform appendage itself. This consisted of a long slender rod, which, though obviously very firm in texture, was not inflexible, and which, therefore, I should judge to be horny rather than calcareous. This rod was invested by a prolonged membranous sac, tolerably wide at the base, but gradually narrowing towards the apex, which appeared to close-in around the base of the rod, so that its cavity seemed completely isolated from the perivisceral cavity in which it lay; and it was to each side of this membranous envelope that the muscular bands were attached, which gave free motion to the styliform appendage.

The body bore *ten* pairs of lateral appendages, of which the *third* was the largest; the size of the 2nd being about the same as that of the 5th and 6th; that of the 1st about the same as that of the 7th; and that of the 8th somewhat smaller; whilst that of the 9th was not above half that of the rest; and the 10th (of whose character I was not at first by any means certain) was merely rudimentary. Each of these appendages consisted at its base of a nearly cylindrical prolongation of the body, transversely wrinkled like it, and containing an extension of the perivisceral cavity; this basal portion gradually narrowed itself, and then underwent bifurcation into two lobes, each of which supported a flattened fin-like expansion of somewhat oval form. In this expansion a sort of fibrous areolation could be seen with a sufficient magnifying power (figs. 2 *a*, 3 *a*). In their usual position these two fins seemed to be nearly at right angles to each other;

and by their incessant action the animal kept up a rapid swimming movement, varying continually in its direction, and very much resembling that of the Branchiopod Entomostraca, the strokes of the several appendages succeeding each other from before backwards.

Owing to the glass-like pellucidity of this interesting little creature, its interior structure can be made out as well as its continual restlessness allows; a further allowance having to be made for the circumstance, that owing to the difficulty occasioned by this very transparency in judging as to what is near and what remote, whilst its restlessness necessitates a continual shifting of the focal adjustment, the relative position of its internal parts cannot always be determined without some liability to error.

The mouth ordinarily opens by an elongated slit (fig. 3) on the underside of the head, into a thick-walled and apparently muscular pharyngeal cavity. This is shown in fig. 3 to be connected with the wall of the body by two bands on either side, one passing anteriorly and the other posteriorly; and it can scarcely be doubted that these are muscles for its protrusion and retraction, since I occasionally saw the pharynx protruded as a proboscis, after the fashion of many Annelids. About half-way between the styliform appendages and the first pair of fin-bearing appendages, the pharynx terminated by a well-marked constriction in the intestinal tube, which was a straight and simple canal whose diameter was usually no more than about a quarter of that of the body itself, and passed direct to the posterior extremity of the body, where it terminated with a pouch-like dilatation in the anal orifice (fig. 5). I never saw any solid matter in this canal; but it was frequently distended in parts by water, a wave of which would occasionally pass peristaltically from one extremity to the other. When thus distended, its wall could plainly be seen to be chiefly composed of ovoidal cells very compactly arranged, as shown in figs. 3, 5. No indications whatever of a dorsal vessel could be distinguished; but the fluid which occupied the large perivisceral space of the body, head, and appendages, could be seen to contain within it minute semipellucid granules of irregular form and size, by whose movements it was made obvious that this fluid was continually shifting its place,—rather in consequence, however (as it appeared to me), of the general movements of the body, than of any more special provision for its circulation.

I could not detect any organs of respiration, and I did not observe ciliary motion on any part of the surface. For the reasons already mentioned, however, I would not take upon myself to affirm its non-existence.

In the head there could be plainly distinguished a bilobed mass having all the appearance of a nervous ganglion; and upon this lay two little masses of pigmentary matter, each of which bore a small pellucid lens-like body (fig. 2). There can scarcely, I think, be a reasonable doubt of these being ocelli. From the central portion of the ganglionic mass, I thought that I could distinguish something very like the axis-band of a nerve-fibre without its tubular sheath, passing backwards along the *dorsal* surface of the body, keeping near to the median line, but not exactly upon it, and passing at intervals not very regular through red spots, which seemed like aggregations of granules, or very minute cells, and of which there were commonly six or seven in each of the divisions of the body. From each side of the bilobed ganglion I thought that I could trace a similar fibre pass-

ing to the styliform appendage; and the membranous sheath of its stylet was studded at intervals with isolated red granules or minute cells, which appeared to me to be connected by delicate fibres having the same general resemblance to the axis-band of ordinary nerve-fibres. I do not speak with any confidence on this point; more especially on account of the *à priori* improbability of the longitudinal nerve-cord being on the *dorsal* aspect of the body. But I think it right to record the fact of the constant presence of these red spots (of which very little notice has been previously taken), and of the apparent existence of fibres passing between them.

The impression at first left on my mind by the study of this interesting creature, of which I had never before seen or heard any account, was that it was a *larval* form, perhaps of an Annelid, but not impossibly of some Isopod Crustacean; the latter notion being suggested by its strong resemblance in habit to the Branchiopod forms of that class. I tried every expedient I could think of, for preserving specimens for subsequent examination and exhibition; but I could not succeed. Any medium in the slightest degree different in density from sea-water caused either an immediate *endosmose*, by which the body was made to burst, generally at the ends of the members; or an *exosmose*, by which it was at once shrivelled-up; and the tendency to disintegration which I have already noticed as showing itself even during life, operated still more strongly so soon as life became extinct.

Not many days after I had made the observations already detailed, I captured a specimen of larger size, having *twelve* pairs of fin-like appendages, and a caudal prolongation destitute of appendages,—its structure being in every other respect the same. And after a few days more I was fortunate enough to obtain (along with several specimens of the younger form) the specimen represented in fig. 6, which can scarcely be considered as anything else than another phase of the same type. Its entire length was about $2\frac{1}{2}$ times as great; but of this only about the anterior three-fifths corresponded in structure to the original, the posterior two-fifths being obviously an addition formed upon a very different plan. Looking first to the anterior portion, we observe that it differs from fig. 1 in the following particulars. The head appears to carry on its front only one pair of horn-like appendages; a careful examination, however, shows that the second or smaller pair is really present, though, from its arising from the under side of the peduncle (which is here relatively shorter), it is concealed by the anterior part of the head when viewed from the dorsal aspect. The styliform appendages are greatly increased in relative length, so as even to pass considerably beyond the anterior three-fifths of the body.

The number of fin-bearing appendages is now *sixteen*; of these the first eight are nearly of equal size; and there is then a gradual diminution down to the 16th, which, though comparatively small, presents the structure characteristic of the rest. The alimentary canal, instead of being limited to a portion of the cavity of the body, now fills it entirely, except in the pharyngeal region; and it seems to be in a state of constant distension, except where narrowed at any part by a wave of peristaltic contraction which occasionally passes from the mouth to the anus. Such a narrowing is seen between the 12th and 13th pairs of fin-like appendages, and is shown on a larger scale at the top of fig. 7. The structure of the canal remains quite simple as far as the 16th pair of appendages, and

closely resembles that which is seen in the narrow canal of the earlier phase when partially distended with fluid.

The posterior portion of the body, however, constituting about two-fifths of its entire length, presents a number of very marked differences in conformation. Its aspect is more cylindrical and worm-like; its parietes are relatively thicker and stronger, and their transverse wrinklings far more decided. It bears eight pairs of slightly-developed appendages, which might at first sight be supposed (especially in regard to their terminal bifurcation) to be rudimentary forms of the fin-feet of the anterior part of the body, but which a more careful examination will show to be formed upon a different plan; for whilst the appendages that bear the fin-feet, as already described, contain extensions of the general cavity of the body, the parietes of which correspond with those of the body itself both in their tenuity and in their delicate transverse wrinkling, those of this vermiform continuation are solid tubercles of ovoidal shape, put forth from the comparatively thick integument, and which do not receive any prolongation of the perivisceral cavity. On reverting to figs. 1 and 5, it will be seen that in that period of the animal's life at which it is most rapidly undergoing increase upon the ordinary type, the last and consequently least developed pair of appendages is still formed upon the same plan with those anterior to it; and the same is the case with the 16th pair in the more advanced form we are now considering. If the 17th and seven succeeding pairs appertaining to this vermiform continuation had any relation to the preceding, we should expect that there would be some gradation from one type to the other; so far is this, however, from being the case, that the 17th pair (the *first* of the vermiform continuation) shows the most decided unlikeness to the 16th (the *last* of the anterior series); the 18th, 19th, 20th, and 21st are of nearly the same size and aspect; whilst the 22nd, 23rd, and 24th become progressively smaller, the last pair being scarcely distinguishable. But further, at the very same point at which this change manifests itself in the condition of the body and of the appendages, there is a very marked change in the condition of the intestinal canal; for this, instead of being continued upon the straight and simple plan which so remarkably characterizes it in the anterior portion of the body, abruptly begins to present the appearance represented in figs. 6, 7. Whether this appearance is due to convolution or to sacculation, I am unable to state with certainty. I was unwilling to submit my only specimen to the compression which would have been requisite to ascertain this point, until I had secured a good delineation of it; and as it died and began rapidly to disintegrate before I could subject it to further investigation, I was deprived of the opportunity of subsequently doing so.

The extreme delicacy of structure and the low grade of development of the earlier phase of this interesting creature having strongly suggested to me that it was a *larval* form, the resemblance presented by the vermiform continuation, in the more advanced specimen, to the ordinary Annelidan type, together with its higher development and its appearance of greater permanence, led me to conjecture that this posterior portion would become the true type of the species, the anterior probably separating itself from it so soon as it should have acquired the power of sustaining itself independently, after the fashion of the Bipinnaria-zooid of the Star-fish. And notwithstanding that the information I have subsequently received as to the phenomena witnessed by other observers

has thrown much doubt on this notion, yet I think it right to record it, for the sake of the suggestion it may afford to those who may have the opportunity of following up the inquiry. Certain it is, that if all the accounts of it be correct records of actual phenomena, and if they all refer (which, for the reasons I have already stated, I can scarcely doubt) to the same specific type, the creature's life-history must vary considerably in different circumstances.

Before referring to the published observations, I shall take advantage of the kindness of Prof. Huxley, who has given me permission to append to my own account of *Tomopteris* his descriptive notes and figures of two specimens captured by him in Torres Strait, during the voyage of the 'Rattlesnake,' Aug. 1, 1849:—

“Body elongated, perfectly colourless and transparent, with thirty-one pairs of lateral appendages, exclusive of what may be termed the head (fig. 8). The body is transversely wrinkled, but not, properly speaking, annulated, there being a great many rings between every two pairs of appendages, especially anteriorly. Posteriorly the wrinklings become coarser and wider, but they are still numerous in proportion to the appendages, and are not true annulations.

“What may be considered to be the head, on account of its containing the mouth and the organs of sense, is provided with two pairs of appendages. The first pair terminate the anterior extremity of the body, the two appendages being united by their base, and disposed transversely. They give the animal the appearance of a hammer-headed shark. Their anterior edge is thin and delicate, the posterior rounded; and this part contains a cavity continuous with that of the body.

“Behind the first pair of appendages the body suddenly narrows into a sort of neck, which expands again into two other transverse processes stouter than the former. Each of these is prolonged at its extremity into a long, slender, curved process nearly equal to half the length of the body, and this process contains a still more slender cylindrical spine, apparently of a horny nature. The end of the spine, covered by a membrane, projects into the cavity of the wide base of the appendage, and its extremity there gives attachment to several bundles of muscular fibres, which go to be attached to the sides of the cavity, and move the spine on occasion.

“In the cavity of the body, situated just where the narrow neck expands into the space which lies between the second pair of appendages, is a transversely elongated mass, which appears to be divided into two parts by a central line. Towards the outer side of each of these parts, there is, upon the dorsal surface, a rounded mass of black pigment, and, imbedded in the outer edge of this, a spherical (?), transparent, crystalline body; these are doubtless eye-spots, and the mass a double ganglion. Two delicate cords connect this double ganglion with the parietes, and I think I could trace a bundle of fibres running down on each side of the mouth; but I am not certain about this, and I am quite sure there was no chain of ganglia along the ventral surface of the body.

“In the cavity of the body likewise, and extending between the second pair of appendages of the head and the first pair of the body, is a narrow, thick-coated, pyriform pharynx. It commences in a rounded oval aperture on the ventral surface, and terminates by opening into the wide stomach. This has much thinner walls, and continues as a

plain tube as far as the first fourteen or fifteen pairs of appendages. It then becomes transversely folded and wrinkled, and thus passes, preserving a very even diameter, to the end of the body.

"The cavity of the body contains, floating about between the intestine and the parietes, certain rounded free masses. These are made up of other more or less rounded masses, flattened when their sides are applied to one another (fig. 9), which have perfectly the structure of ova. These ova had a diameter of $\frac{1}{250}$ th of an inch, and less. In those of the former size the germinal vesicle measured $\frac{1}{25}$ th of an inch, and was clear and delicate. The germinal spot, vesicular and thick-walled, measured $\frac{1}{1600}$ th of an inch.

"The appendages are hollow processes of the body, and their cavities are continuous with that of the body, as was evident from the passage of the ova from the one into the other. They increased in size to the fourth or fifth pair, and diminished again from the seventh or eighth. The first sixteen or seventeen pairs consisted of a stout basal portion terminated by two divisions, each of which was provided with a flat, vertical oar-like expansion. The remaining appendages became smaller and smaller and more rudimentary. The anterior ones were provided with two conical processes merely, while the posterior ones were themselves nothing but short simple processes. There was a short space between the last pair of processes, which were mere buds, and the truncated anal extremity.

"At the re-entering angle between the second pair of cephalic appendages and the narrow neck, there is, on each side, a rounded elevation, from which a sort of band or ridge runs back upon the dorsal surface.

"On the ventral surface, close to the two rounded elevations, a long, curved, spine-like process arises upon each side. In their natural position these two processes lie parallel with one another, one on each side of the mouth.

"Aug. 28th.—A small specimen obtained to-day appears to be a male, for it contained masses of round cells, each rather more than $\frac{1}{5000}$ th of an inch in diameter, in the place of the masses of ova of the previous specimen; these were perhaps young spermatozoa. In other particulars its structure agreed with the foregoing."

It is obvious that Professor Huxley's specimen must have been in a more advanced stage of development than mine, since it had no fewer than thirty-three pairs of appendages, and was also maturing its sexual organs. His figure and description indicate that the conformation both of the body and extremities underwent a change at about the sixteenth or seventeenth pair; but the transition seems to have been far less abrupt than it was in my specimen; so that he does not appear to have been struck with any very decided difference in the conformation of the anterior and posterior parts of the body. And his figure of one of the appendages of the latter would seem to indicate that in their more advanced condition these approach more nearly to the type of those of the anterior, than they seemed to me likely to do.

Tomopteris onisciformis was first described by Eschscholtz, who briefly characterized and rudely delineated it in the 'Isis' for 1825 (p. 735, pl. 5. fig. 5), assigning to it a place

among Heteropodous Mollusks. He would appear to have met with it only in its earlier phase; for his figure shows no more than twelve pairs of lateral appendages, without any caudal prolongation.

It seems, however, to have been previously (?) observed by Quoy and Gaimard, who met with it in the Bay of Gibraltar during the voyage of the 'Astrolabe;' but as their account of it was first published in 1827 (*Annales des Sciences Naturelles*, tom. x. p. 235), the name *Briarea scolopendra*, by which they designated it, must yield in priority to that of Eschscholtz. The specimen which they describe as having been taken in the Bay of Gibraltar, is stated to have attained a length of 4 inches. If there be no error in this description, it must have been far larger than any that has been elsewhere met with. They speak of it as possessing 24 or 25 pairs of lateral appendages or fin-feet; of these, however, their figure shows only 21 pairs, of which 17 belong to the body, and 4 to the caudal prolongation. If this figure (which strikes me as in many respects rather an ideal diagram than a true representation) approaches in any degree to the real proportions of their specimen, its lateral appendages must have been very much longer than those figured by any of the other naturalists who have described it, their maximum length being in the anterior portion of the body, and a progressive diminution taking place as far as the commencement of the caudal prolongation, behind which they are merely rudimentary. Thus the outside contour of the entire animal is not very dissimilar to that of a boy's kite, the caudal prolongation representing the tail. It is somewhat singular, that, notwithstanding the extreme transparency of this animal, MM. Quoy and Gaimard were unable to make out its alimentary canal, although they described and figured what they believed to be ova. They considered *Briarea* to be a Mollusk, nearly allied to *Glaucus*.

In Müller's Archiv for 1847, there are a description and a figure of *Tomopteris onisciformis* by Busch, who met with it in the North Sea. This figure nearly corresponds, except in the proportional shortness of the lateral appendages, with that of MM. Quoy and Gaimard. The number of these appendages which Busch represents is 18 pairs, the form of all being the same, and their size diminishing gradually from the 1st pair to the 18th, which is close to the posterior extremity of the body, there being no distinct caudal prolongation. Busch described and figured the ova in the perivisceral cavity, as Professor Huxley has done subsequently; and he also noticed other bodies which seem to correspond with what Professor Huxley regarded as bundles of spermatozoa.

In the succeeding volume of the same Journal (1848) is a very elaborate memoir by Grube on *Tomopteris*, based on specimens collected by Krohn (probably in the Mediterranean), and preserved in the Museum of St. Petersburg. This memoir is specially devoted to the description of some of the minutest details of the structure of the animal, and to the inquiry into its place in the zoological scale. Grube's figure of the entire animal is not only small in scale, but is somewhat rudely sketched; it represents twenty pairs of lateral appendages, and a caudal prolongation of cylindrical form, apparently without any appendages at all. In his description, however, the author speaks of this caudal prolongation as bearing rudimentary fins, in the form of whitish protuberances; these, he remarks, are as yet undivided; whilst the fully-developed appendages of the anterior part

of the body are bifid, and in large specimens the lobes of the posterior not-fully-developed appendages are relatively larger than the former. One of the most important parts of Grube's memoir relates to the nervous system. He asserts that he has distinctly seen, in many specimens, a double nervous cord passing backwards along the ventral surface of the body from an œsophageal ring, of which the upper part is formed by the cephalic ganglia. This double cord, he says, does not anywhere present ganglionic enlargements; but, when examined under a high magnifying power, it presents a series of transverse striæ at short intervals. I cannot but express some doubt as to the existence of this ventral cord; for Grube's description of it is entirely based upon preserved specimens*; and although I looked for it carefully and repeatedly in living specimens, I was not able to detect it. Grube's description of the muscular structure also, especially in the fins, is very minute; but I can state confidently that this presents itself under a very different aspect during life; indeed, as to the general histology of the creature, I was struck with the remarkable change which it seemed to undergo when the animal appeared to be suffering from confinement, but while as yet far from having lost its vital activity.

The most recent notice of *Tomopteris* is that given of it by Mr. Gosse in his 'Naturalist's Rambles on the Devonshire Coast' (p. 356), under the name of *Johnstonella Catharina*; it adds nothing, however, to what had been previously recorded, excepting as to the occasional eversion of the pharynx so as to form a protruded proboscis, which Mr. Gosse seems to have been the first to observe. His specimens appear to have been in the same stage of development as my most advanced specimen, having 16 pairs of fin-like appendages, and a caudal prolongation without any obvious appendage. He seems to have overlooked the posterior pair of frontal "horns," which, for the reason I have stated, are not to be seen in the larger specimens unless carefully looked for. In his 'Marine Zoology' (vol. i. p. 106), Mr. Gosse has introduced *Tomopteris* (by its proper designation) amongst the "animals of doubtful position, probably belonging to the Annelida;" and he has given a figure of it, which, like the figure in his 'Devonshire Coast,' wants the second pair of frontal "horns," and which is further erroneous as giving not the least indication of the bifid character of the fin-like appendages.

There cannot, I think, be any longer a reasonable doubt as to the Annelidan character of *Tomopteris*; and the principal point which now requires investigation seems to me to be the question of the real nature of the caudal prolongation,—that is, whether it is simply an extension of the body, or is a zooid destined to be cast off and to maintain an independent existence. The former view seems to be that of all previous observers; no such marked peculiarity having been observed by them, either in the conformation of its appendages, or in the structure of its integument and of the portion of the alimentary canal included in it, as that which seemed to me to differentiate it completely from the anterior part of the body, and to bring it nearer to the ordinary Annelidan type. I speak with diffidence, however, on these points, since I find myself at issue in regard to them

* It would be interesting to know in what fluid these specimens were mounted; as I tried all the ordinary media without succeeding in preserving in any specimens an approach to their life-like appearance.

with observers of unquestionable competency. And if, as would seem scarcely to admit of doubt, the process of sexual generation is carried on in the portion which I imagined to be larval, such a notion of its character becomes obviously untenable. I have deemed it right, however, to record my first impression, that any observers to whom the animal may present itself may have their attention more strongly directed to the peculiarities of structure by which it was suggested. And as the animal does not seem to be very uncommon on our coasts (having been taken by the late Dr. Robert Ball in the Bay of Dublin, and by Dr. S. J. Salter in Poole Harbour, as well as by Mr. Gosse and myself), it may be hoped that further light may ere long be thrown upon this question, as well as upon the nature and distribution of the nervous system of this beautiful and interesting creature.

[SUPPLEMENTAL NOTE.—Subsequently to the reading of the foregoing paper, another memoir on *Tomopteris* has been published in Müller's Archiv, 1858, p. 588, by Drs. Lenckart and Pagenstecher. These observers describe, under the name of *Tomopteris onisciformis*, a specimen with twelve pairs of fin feet and a caudal prolongation destitute of appendages, corresponding closely in its grade of development with a specimen I have mentioned in p. 354. In the perivisceral cavity of the anterior part of its body, they distinguished sexual products, as Busch and Huxley had done. They also describe, under the name of *Tomopteris quadricornis*, a smaller specimen, having only ten pairs of fin feet, and obviously identical with those first seen by me; this they consider to be specifically distinguished from the preceding by the presence of two pairs of horn-like appendages, the *T. onisciformis* seeming to have but one. I have already mentioned, however, that the second pair really exists in the larger specimens as in the smaller (p. 354); so that there is no reason for regarding the two as otherwise than specifically identical, the difference in the number of fin feet being obviously a character of age merely.]

EXPLANATION OF THE PLATE.

TAB. LXII.

- Fig. 1. Young specimen of *Tomopteris* with ten pairs of fin feet; enlarged 10 diameters.
 Fig. 2. Head and anterior part of the body, as seen upon the dorsal aspect, enlarged 38 diameters; *a*, bifid extremity of one of the fin feet.
 Fig. 3. The same, as seen upon the ventral surface.
 Fig. 4. Front view of the head, showing the position of the two anterior pairs of cephalic appendages, and the opening of the mouth upon the ventral surface.
 Fig. 5. Caudal extremity, showing the last two pairs of least-developed fin feet, and the termination of the intestine in an anal orifice.
 Fig. 6. Advanced specimen of *Tomopteris* with sixteen pairs of fin feet; enlarged 10 diameters.
 Fig. 7. Posterior extremity of the body of the specimen represented in fig. 6, with its last four pairs of ordinary fin feet, giving origin to a caudal prolongation of very different conformation, furnished with eight pairs of rudimentary appendages.
 Fig. 8. Specimen of *Tomopteris* with thirty-three pairs of appendages (*Huxley*).
 Fig. 9. Masses of ova in the perivisceral cavity of the preceding (*Huxley*).